Chapter 4
COSTS AND OPERATIONS

4.0 INTRODUCTION

This chapter summarizes the estimated Capital, Operations and Maintenance (O&M) Costs, and Operational Performance associated with the LOSSAN Rail Corridor Improvements evaluated in this Program Environmental Impact Report / Environmental Impact Statement (Program EIR/EIS). The O&M Costs for the LOSSAN Rail Corridor Improvements were developed based on the operations plan and network simulation model, which represents the physical characteristics of the No-Project Alternative and proposed Rail Improvements Alternative and the performance characteristics of the conventional train equipment currently in use by the rail operators.

4.0.1 Capital Costs

The Capital Costs that were calculated for the improvements to the LOSSAN corridor were calculated using 2003 dollars. The costs are associated with infrastructure improvements defined for each alternative and do not include the costs associated with the No-Project Alternative. The programmed and funded improvements included under the No-Project Alternative are assumed to have been implemented by 2020.

A. RAIL IMPROVEMENTS ALTERNATIVE

Capital costs were estimated for all of the proposed improvements along the LOSSAN corridor evaluated in this Program EIR/EIS. Because of the variations in the improvements being considered in the environmental analysis process, there is potentially a wide range of capital costs associated with this corridor.

The capital costs are representative of all aspects of the implementation of improvements to the conventional train system, including construction, potential right-of-way acquisition, environmental mitigation, and design and management services. The construction costs include procurement and installation of additional line infrastructure (tracks, bridges, tunnels, and grade separations); facilities (passenger stations, additional storage and maintenance facilities); systems (communications, train control); and removal or relocation of existing infrastructure (utilities, tracks). The right-of-way costs include the estimated costs to acquire properties needed for construction of the additional infrastructure associated with the conventional rail improvements. The environmental mitigation costs include a rough estimate of the proportion of capital costs required for mitigating environmental impacts, based on similar completed highway and railroad construction projects. However, no specific mitigation costs are identified at this program level of review. Infrastructure and facility costs account for the materials necessary to accommodate the representative (high-end) ridership forecasts. Other implementation costs are estimated in terms of add-on percentages to construction costs to account for agency costs associated with administration of the program (design, environmental review, and management).

Unit Cost Estimates

The capital costs have been categorized into discrete cost elements. In general, the capital costs were estimated by determining the appropriate unit costs for the identified elements and the element quantities from the conceptual corridor improvement plans prepared for the LOSSAN corridor. Each cost element is defined in Appendix 4-A, along with the methods, assumptions, and unit cost applied in each case. Application of these unit costs and assumptions provides sufficient detail for the comparison of alignment and station options at this program level.

Adjustment to Unit Costs

The unit costs were adjusted to account for inflation from 2000 to September 2003, based on the *Engineering News Record Construction Cost Index Report*. The revised unit costs are based on the unit costs originally developed by the California High-Speed Rail Authority to be used in estimating the cost of incremental improvements to the conventional rail system along the LOSSAN corridor to allow for the intercity service operating along this corridor to perform as a feeder service to the proposed statewide High Speed Train (HST) system.

Adjustments were also made to the tunneling unit costs, based on the Tunneling Conference held in December 2001. This technical tunneling conference was held to address issues associated with the tunneling proposed for the statewide HST system. The conference was attended by seven representatives of major tunneling contractors, nine specialized tunneling consulting engineers, two geologists/geotechnical engineers, and representatives of the consultant team. The conference reviewed past assumptions and requirements, construction methods, and cost estimating. The conference focused on gaining insights and input regarding feasibility, construction methods, and cost assumptions associated with the proposed tunneling. As a result of the conference and subsequent research and analysis, the tunneling-related unit costs were revised to reflect changes in design and construction assumptions (e.g., advance rates and tunnel lining).

4.0.2 Operational Performance

As part of the Operational Analysis, a network computer model was developed for the LOSSAN corridor to simulate train operations in order to estimate the travel times and speeds to assist in further analyzing the effects between the No-Project and Rail Improvements Alternatives.

The Berkeley Simulation Software Rail Traffic Controller model was selected as the platform for the LOSSAN corridor simulation model (the Model) developed for this analysis. The Model provides a range of analysis and reporting capabilities encompassing the range of information required for this analysis and can realistically simulate higher-speed train operations in a mixed-use operational environment (Commuter and Freight services). The advantage of the Model is that it is designed as a flexible tool that can continue to be modified, refined and upgraded to evaluate different operational and infrastructure configurations. The numbers that were input into the model were based on the existing and forecasted service numbers provided by the operators within the corridor.

A. OPERATING SPEEDS

Operating speeds of 110-125 mph are proposed for areas where the alignment is less constrained, and lower operating speeds (less than 90 mph) are proposed in the more heavily developed areas. Due to the spacing between stations, service would not necessarily reach the maximum speeds on a given segment. Figures 4.0-1 and 4.0-2 show the operating speed profiles put out by the model. These graphics illustrate the speeds that can be attained through implementing the Rail Improvements Alternative.

The gray regions in both charts represent the proposed maximum allowed speed along a given segment of the corridor. The green line represents the actual speed of each train and the red the dynamic braking application. As shown in both the Low- and High-Build Rail Improvements Alternative, the maximum allowed speed for a given segment of track is rarely achieved due to the time it takes to accelerate and decelerate a train.

B. CONCEPTUAL OPERATING SCHEDULE

The degree of service to be provided along the corridor formed the basis for the train data that was input to the Model. The service levels tested in the system network simulation were provided by the operators for forecast year 2020. The level of operation projected for intercity travel would allow for hourly service along the corridor. The service type and stopping patterns of the corridor operators is summarized below:

- <u>Intercity (16 trains per day in each direction)</u>: Trains stopping at all intermediate stops, with potential for skipping stops to improve service depending on demand.

- <u>Commuter</u>:

  Metrolink (29 trains per day in each direction north of Irvine / 8-18 trains a day between Irvine and Oceanside): Trains would stop at all intercity and commuter stations with no express service provided.

  Coaster (27 trains per day in each direction): Trains would stop at all intercity and commuter stations with no express service provided.

- <u>Freight (9-12 total trains per day)</u>: No stops at stations, freight consists only and would provide service to local branch lines and industries along the corridor.

These service levels represent projections provided by the operators along the corridor based on the projected demand for service and were incorporated into the model to assist in determining any capacity constraints associated with the scenarios.

Figure 4.0-1
Low-Build Operating Speed & Travel Time Profile

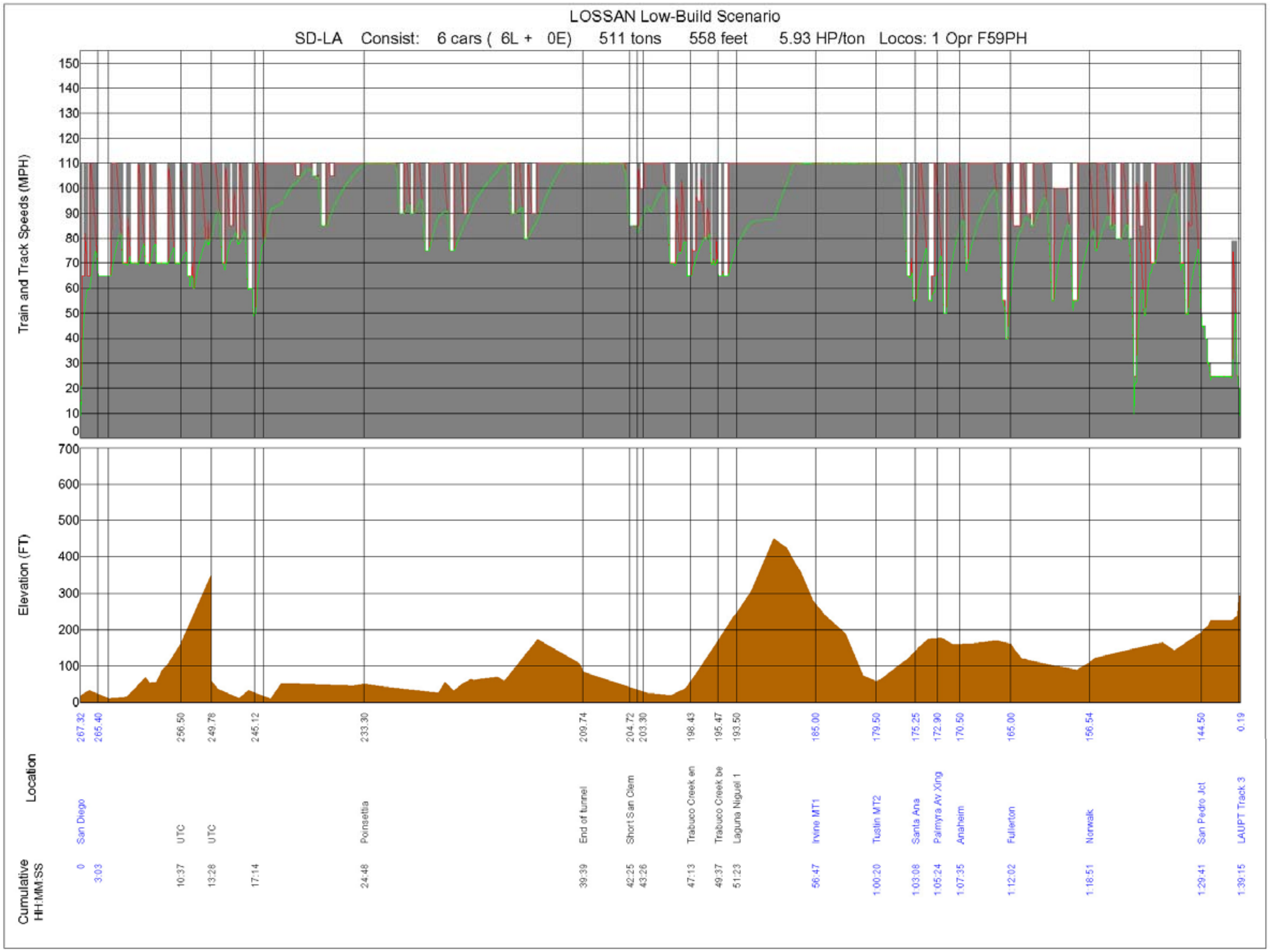
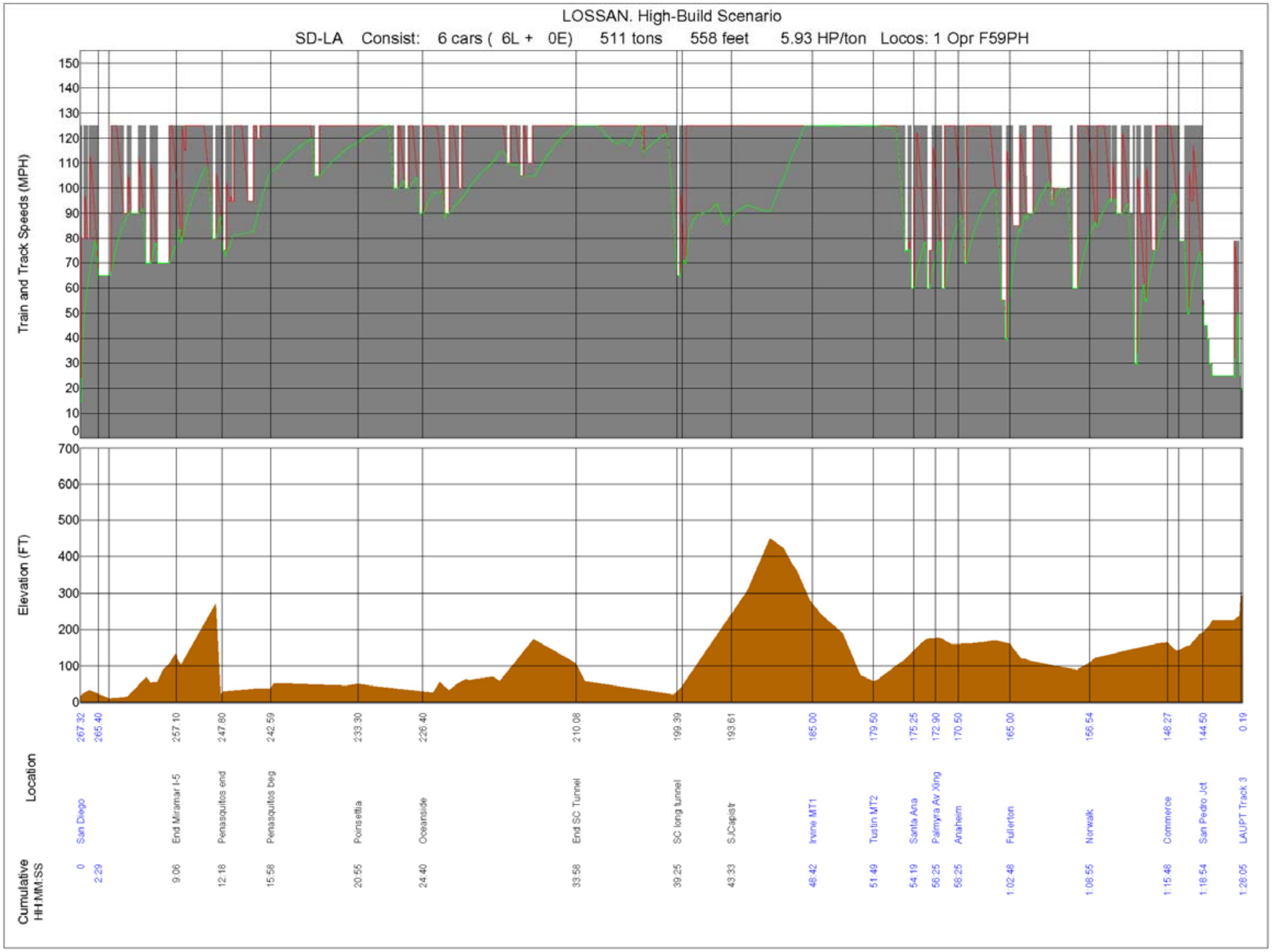


Figure 4.0-2
High-Build Operating Speed & Travel Time Profile



4.0.3 Operations & Maintenance Costs

Operations and Maintenance (O&M) Costs were calculated for the LOSSAN corridor improvement alternatives and were assumed to be in addition to the costs of the existing system. Therefore, only the incremental (marginal costs) to operate and maintain the improved conventional rail system beyond the existing system were estimated.

A. METHODOLOGY

The annual O&M costs of an improved LOSSAN corridor are based on system indicators, including operating speed, travel time, station configuration, and operating schedule. All of these system indicators were obtained from the output of the operational simulation model as documented in the Operations Analysis Report for this Program EIR/EIS.

O&M costs are shown in 2003 dollars and were calculated per-train-hour, using the most recently obtained Amtrak billing data for fiscal year 2002-03. Total yearly costs were averaged to derive average, per-train-hour costs for the categories shown in Table 4.0-2 on the following page. It must be noted that the table shows only the variable cost elements for Amtrak expenses incurred for O&M by category, to reflect the marginal costs associated with the proposed service improvements.

B. RAIL IMPROVEMENTS ALTERNATIVE

Operations & Maintenance Annual Costs

The projected annual O&M Costs for an improved intercity rail system along the LOSSAN corridor are based on the track miles and train hours resulting from the simulation model described above in the Operational Analysis, which was based on information obtained from the Department and Amtrak, and the unit costs developed initially by the California High Speed Rail Authority. Updated estimates of total train miles from the simulation model have provided a cost estimate for both the Low- and High-Build Rail Improvements Alternative developed for the LOSSAN Corridor Incremental Improvements Study.

In order to determine the O&M Costs associated with the proposed improvements, daily train miles and hours were calculated. The number of train miles for the intercity passenger system along an improved LOSSAN corridor (assuming the Low-Build Rail Improvement Alternative) is 4,080 per weekday, or 1,489,200 per year, and the total number of train hours per day was determined to be 64, or 23,360 per year. Table 4.0-2 summarizes annual O&M unit costs for train operations and maintenance assuming the Low-Build Rail Improvements Alternative, for all future scenarios of the conventional intercity rail system. Included in the O&M costs are only the variable costs that would be sensitive to a change in travel time, which includes wages for labor, costs for operating and maintaining trains, and train fuel. Cost items including general support, general administration, insurance and taxes, depreciation and supplemental expenses were not considered in the cost calculations since they would not vary significantly with a change in end-to-end travel time. The conventional train fleet O&M costs are shown on a per-train-hour basis.

Table 4.0-2
Incremental Annual Operating Costs for a Conventional Intercity Rail System

Item[1,2,3]	Annual Cost (millions 2003 $)	Derived Annual Dollars per Train Hour (2003 $)
Wages		
Train and Engine Crews	$ 6.86	$ 310.85
On-Board Svc - Labor	$ 2.45	$ 111.11
Daily Operations		
Train Fuel	$ 3.47	$ 156.94
Transportation	$ 11.17	$ 505.79
Maintenance of Equipment	$ 9.41	$ 426.13
Total per Year	**$ 33.36**	**$ 1,510.81**

[1] O&M costs were derived using the billing statements from *Monthly Expense Detail of Amtrak Operations Billing for Pacific Surfliner Route Report - FY 2002-03.* September 2003
[2] O&M costs are based on a calendar year - 365 days.
[3] Numbers are subject to rounding.
Source: Amtrak California 2003

Other costs associated with operating a conventional train system include the costs for maintaining the infrastructure (maintenance-of-ways). The costs of operating and maintaining infrastructure for a conventional intercity rail system are shown on a per-track-mile basis in Table 4.0-3. The unit cost per-track-mile for track maintenance represents average costs. It must be noted that the unit cost per-track-mile may vary significantly, based on track type (at-grade, trench, tunnel, or water crossing).

Table 4.0-3
Annual Maintenance of Way Costs for a Conventional Rail Infrastructure

Item[1,2,3]	Annual Dollars per Track Mile (2003 $)
Maintenance of Way	
Track Maintenance[4]	$ 11,616
Signal Maintenance	$ 12,076
Structure Maintenance	$ 2,329
Procurement	$ 2,066
Other	$ 8,696
Agency	$ 11,616
Total per Year	**$ 48,399**

[1] O&M costs were derived using the billing statements from *Monthly Expense Detail of Amtrak Operations Billing for Pacific Surfliner Route Report - FY 2002-03.* September 2003
[2] Total existing number of track miles between Los Angeles and San Diego is estimated at 214 miles.
[3] Numbers are subject to rounding.
[4] The figure shown represents an average cost, based on available information.
Source: Southern California Regional Rail Association (Metrolink) 2003

4.0.4 Comparison of Alternatives

A. NO-PROJECT VS. RAIL IMPROVEMENTS ALTERNATIVE

This section compares the Rail Improvements Alternative with the No-Project Alternative to allow for a clear understanding of the cost and performance benefits and impacts of the scenarios proposed in this environmental document.

Capital Costs

For the improvements along the corridor, comprised of either the Low-Build or High-Build Rail Improvements Alternative, or a mixture of both, the capital costs could range from $3.8 to $5.5 billion in addition to the improvements already implemented as part of the No-Project. The proposed alignment and station configuration options and design assumptions will be reviewed in greater depth at the project-level to identify cost savings through application of value engineering practices.

Operational Performance

The train operations and improvements assumed for the LOSSAN corridor in 2020 in the No-Project were simulated to estimate the capacity of the corridor between the Los Angeles Union Passenger Terminal (LA Union Station) and the San Diego Santa Fe Depot (San Diego) to determine the feasibility of this system to support more frequent and higher speed passenger rail service with only the funded and programmed improvements implemented. As illustrated in Table 4.0-4 below, using the operational assumptions presented above in Section 4.0.2-C, the average speed and travel time of the No-Project Alternative is significantly worse than the Low- and High-Build Rail Improvements Alternative, taking almost 38 minutes longer from LA Union Station to San Diego. These averages represent the actual travel time and speed calculated when assuming the full range of operations projected to be occurring along the corridor by 2020.

Table 4.0-4
Operational Intercity Rail Performance Comparison
No-Project vs. Rail Improvements Alternative

	Existing Conditions[1]	No-Project Alternative[2]	Rail Improvements Alternative	
			Low-Build[2]	High-Build[3]
Projected Travel Time (Hours:Minutes)	2:44	2:36	1:58	1:48
Average Speed (mph)	47	50	63	69

[1] Assumes 7 intermediate station stops
[2] Assumes 8 intermediate station stops
[3] Assumes 9 intermediate station stops

The existing condition provides a travel time of almost 3 hours for intercity passenger rail between LA Union Station and San Diego. This travel time is representative of single track operations and demonstrates the delay that results from the interference between trains caused by having to wait along a siding for the passing of a train in the opposite direction. In the event of incidents, existing segments of single track can account for even more unreliability and delay in the travel times along the corridor, providing for an even slower travel time.

With Intercity Passenger Rail ridership along the corridor projected to top 5 million by the year 2020 as well as the planned expansion of commuter rail services and freight operations, the improvements identified in the No-Project Alternative do little to relieve the capacity and reliability constraints. The lack of significant travel time savings represented in the No-Project Alternative is largely the result of the remaining segments of single-track present. As stated previously, single track segments create "chokepoints" where trains are delayed in sidings, holding for trains to pass in the opposite direction. These delays are eliminated in both the Low- and High-Build Rail Improvements Alternative as the corridor would be improved to incorporate double-track along its entire length from LA Union Station to San Diego, providing operational benefits for all rail services.

Implementing the projects identified as part of either Rail Improvements Alternative would provide for a fully double-tracked rail corridor that offers to the passenger six specific advantages over the No-Project Alternative:

1) <u>Increased Capacity & Average Speed</u>. The proposed corridor improvements will produce improved corridor geometrics, straightening the alignment wherever possible, but most importantly, will eliminate all single track segments, providing greatly increased capacity within the corridor. With these improvements, maximum speeds of 90mph will be possible in urban area (e.g. Los Angeles and San Diego) and 110 to 125mph in more rural areas (e.g. Camp Pendleton). Using the plans and profiles designed for the corridor improvements that incorporate the double-tracking and new geometrics, and track charts where necessary, an operational model was developed which determined the average speed for the Rail Improvements Alternative would increase an average of 16 to 22 miles per hour (mph) ranging from 63 to 69mph, depending on the improvements selected, when compared to existing conditions (47mph), and an average improvement of 13 to 19mph when compared to the No-Project Alternative (50mph). These speeds are an average that incorporates the deceleration and acceleration rates for curves and station areas, and locations where speed restrictions have been removed or may still be present.

2) <u>Reduction in Travel Time.</u> With increased speed there are improved travel times. Depending on which Rail Improvements Alternative is selected, passengers could save as many as 45 to 60 minutes on their trip between Los Angeles and San Diego when compared to existing conditions. This is a 28 to 34-percent reduction in travel time. The No-Project Alternative only produces an average of an 8-minute (or a 5-percent) savings in travel time. These times assume local service, which would stop at all stations. The Rail Improvements Alternative would be able to further decrease travel times by also allowing for the potential of skip-stopping/express service along the corridor. For example, express service which made only 3 intermediate stops could further reduce the overall travel times by up to 20 minutes, assuming an average time of 4 minutes per station stop.

3) <u>Increased Safety & Reliability.</u> With the increase in capacity provided by double-tracking the length of the corridor, reliability will be greatly improved. Both safety

and reliability would further increase in the High-Build Rail Improvements Alternative, as this alternative would grade-separate the length of the corridor, eliminating all remaining at-grade crossings.

4) Enhanced Multimodal Opportunities. Slow travel times and restricted reliability often deter people from using public transportation alternatives. With the improvement in reliability and travel times making it easer to reliably connect to other transit modes, passengers would be provided with additional transportation options.

5) Operational Flexibility. Two tracks allow for trains to pass each other easily along all segments of the corridor, eliminating the delay caused by waiting at single-track segments, and allows for operational options such as "skip-stopping", express trains, and other improved service choices for both Intercity and Commuter rail services. The Rail Improvements Alternative would also provide for rail operational enhancements to be made such as providing for the flexibility necessary to accommodate planned future expansions in Intercity and Commuter rail service frequencies.

6) Reduction of Vehicle/Rail Conflicts. The Low-Build Rail Improvements Alternative will significantly reduce the number of at-grade crossings along the corridor, while the High-Build provides for a fully grade-separated corridor. However, both of these improvements provide for significant improvements in:

   a. *Safety* – Reduces the number of vehicle/rail/pedestrian conflicts at crossings
   b. *Reliability* – Reduces delays associated with vehicle/rail/pedestrian conflicts for both train and automobiles. Elimination of at-grade crossings reduces the delay of automobile traffic by preventing automobiles from stopping for trains at crossings.
   c. *Noise* – Eliminates the need for horns at crossings
   d. *Pollution/Energy* – By reducing the amount of delay for automobiles at grade crossings, the amount of pollution emitted by idling vehicles is significantly reduced.

Operations & Maintenance Costs

Operations & Maintenance (O&M) Costs were calculated for the scenarios that represented the three corridor alternatives (No-Project, Low-Build and High-Build Rail Improvements Alternatives). Total annual O&M costs for operating and maintaining trains ranges from $58.1 million for the No-Project Alternative and $47.7 and 45.3 million for the Rail Improvement Alternatives. The total annual O&M costs for operating and maintaining trains decreases for the Rail Improvements Alternative from the No-Project, due to increased operating efficiency (decreased travel times, faster train turn-around times and replacement/upgrading of infrastructure).

B. LOW-BUILD VS. HIGH-BUILD ALTERNATIVE

Though both the Low- and High-Build Rail Improvements Alternative provide the capacity improvements necessary to accommodate the levels of service projected for the LOSSAN corridor, their associated costs and overall operational performances differ.

This section provides a clear comparison between the Capital Costs, Operational Performances, and O&M Costs of the Low- and High-Build scenarios.

Capital Costs

Both the Low-Build and High-Build Rail Improvements Alternative include a mix of double-, triple-, and quadruple tracked segments. The derived capital cost estimates for the Low- and High- Build Rail Improvements Alternatives are directly affected by type of cost elements and the estimation of quantities for the improvement options. Because the High-Build Rail Improvements Alternative incorporates the highest level of extensive infrastructure investment and/or construction complexity, this option also has the highest estimated capital costs associated with the proposed improvements. The range of capital costs between the Low- and High-Build Rail Improvements Alternative is $3.8 to $5.4 billion (a difference of forty five percent).

The estimated total capital costs for the Rail Improvements Alternative is summarized in Table 4.0-5 below. Further detail regarding the capital costs is provided in Appendix 4-A.

Table 4.0-5
Capital Cost Summary

Area / Options	Improvements Considered	Estimated Capital Costs
Downtown San Diego		
(*Low-Build*)	Double Tracking and Curve Straightening; San Diego River Bridge	$33 million
(*High-Build*)	Double Tracking and Curve Straightening; San Diego River Bridge; Trench between Sassafras St and Cedar St (includes partial or full grade separation)	$310 million
University Towne Centre		
Interstate-5 Freeway Tunnel Option (*Low-Build*)	Double Tracking and Curve Straightening (including tunnel under Interstate-5 Freeway)	$440 million
Miramar Hill Tunnel Option (*High-Build*)	Double Tracking and Curve Straightening (including tunnel under University City/Miramar Hill with new station)	$370 million
Del Mar		
Camino Del Mar Tunnel #1 Option (*Low-Build*)	Double Tracking and Curve Straightening (including tunnel under Camino Del Mar; crosses San Dieguito and Los Penasquitos Lagoons)	$365 million
Penasquitos Lagoon Bypass Tunnel Option (*High-Build*)	Double Tracking and Curve Straightening (including tunnel along Interstate-5; Penasquitos Lagoon Bypass Option averts San Dieguito and Los Penasquitos Lagoons)	$560 million

Area / Options	Improvements Considered	Estimated Capital Costs
Encinitas		
At-Grade with Grade Separations Option (*Low-Build*)	Double Tracking and Curve Straightening along existing alignment (including partial grade separation)	$154 million
Short Trench with Grade Separations Option (*High-Build*)	Double Tracking and Curve Straightening along existing alignment (including full grade separation)	$305 million
Carlsbad to Oceanside		
At-Grade Option (*Low-Build*)	Double Tracking and Curve Straightening along existing alignment (including partial grade separation); crosses San Luis Rey, Buena Vista, Aqua Hedionda, and Batiquitos Lagoons	$270 million
Trench Option (*High-Build*)	Double Tracking and Curve Straightening along existing alignment (including full grade separation); crosses San Luis Rey, Buena Vista, Aqua Hedionda, and Batiquitos Lagoons	$420 million
Camp Pendleton		
(*Low- and High-Build*)	Double Tracking along existing alignment; crosses Santa Margarita River	$39 million
Dana Point/San Clemente		
Short Tunnel Interstate-5 Freeway Option (*Low-Build*)	Dana Point Curve Straightening; San Clemente – Short Tunnel; Double Tracking (crosses San Mateo and San Onofre Creeks)	$895 million
Long Split (Two Segment) Tunnel with Station Option (*High-Build*)	San Clemente – Long Slit Two Segment Tunnel with Station Construction; Double Tracking (crosses San Mateo and San Onofre Creeks)	$1.2 billion
San Juan Capistrano		
Trabuco Creek Cut-And-Cover Tunnel (Covered Trench) Option (*Low-Build*)	Double Tracking and Curve Straightening (including Covered Trench between Trabuco Creek and Avenida Aeropuerto (trench goes under San Juan Creek)	$200 million
Interstate-5 Tunnel Option (*High-Build*)	Double Tracking and Curve Straightening (including Tunnel beneath I-5 between Hwy 73 and Avenida Aeropuerto (tunnel goes under Trabuco Creek and San Juan Creek)	$560 million
San Juan Capistrano to Irvine		
	No Major Improvements Planned	$0

Area / Options	Improvements Considered	Estimated Capital Costs
Irvine to Fullerton		
At-Grade Option (*Low-Build*)	Curve Straightening (including partial grade separation)	$720 million
Covered Trench Option (*High-Build*)	Double Tracking and Curve Straightening (including Covered Trench in Orange and Santa Ana) (including full grade separation)	$860 million
LA Union Station to Fullerton Station (4th Main Track)		
(*Low- and High-Build*)	Addition of Fourth Main Track (including full grade separation)	$730 million
Total Cost for LOSSAN Corridor Improvements		
Low-Build Scenario		**$3.8 billion**
High-Build Scenario		**$5.4 billion**

Operational Performance

Although there are several differences between the Low- and High-Build Rail Improvements Alternative, these variations provide solutions that improve travel time but do not measurably affect capacity (i.e. the number of main tracks to support the train volumes assumed for 2020).

As shown in Table 4.0-6, the overall difference in travel time along the length of the corridor from LA Union Station to San Diego between the Low- and High-Build Rail Improvements Alternative is 10 minutes, assuming the projected corridor traffic for 2020, with the High-Build Rail Improvements Alternative producing an average travel time of 1 hour and 48 minutes compared to 1 hour and 58 minutes with the Low-Build.

Table 4.0-6
Operational Performance Comparison
Low-Build vs. High-Build Alternatives

	Low-Build	High-Build
Projected Travel Time (Hours:Minutes)	1:58	1:48
Average Speed (mph)	63	69

Corresponding to the faster travel time shown in Table 4.0-6, and as a result of the improved curve geometrics of the High-Build over the Low-Build Rail Improvements Alternative, the High-Build has an average operating speed that is 6 mph faster over the length of the corridor when compared to the Low-Build, with the High-Build achieving an average operating speed of 69 mph and the Low-Build an average speed of 63 mph.

In addition, both safety and reliability would further be increased in the High-Build Rail Improvements Alternative, as this alternative would grade-separate the length of the corridor, eliminating all remaining at-grade crossings.

The specific improvements identified under the Low- and High-Build Rail Improvements Alternatives would provide varying levels of travel time enhancements to each station segment along the corridor. Several of the individual improvements incorporated into the Rail Improvements Alternative provide significant travel time and reliability enhancements at locations such as San Juan Capistrano, San Clemente, Del Mar, and Miramar Hill (University City). Table 4.0-7 breaks down the travel time savings by station segment to help provide a summary of how each of the individual projects contributes to the overall improvements along the corridor. The Baseline Condition travel times are provided in order to allow of a comparison of travel times between the Rail Improvements Alternative and existing conditions.

Table 4.0-7
Intercity Rail Station Segment Travel Time Comparison
(Hours:Minutes)

	Baseline Condition	No-Project Alternative	Rail Improvements Alternative	
			Low	High
Los Angeles to Fullerton	0:37	0:34	0:29	0:26
Fullerton to Anaheim	0:09	0:07	0:06	0:06
Anaheim to Santa Ana	0:10	0:09	0:06	0:06
Santa Ana to Irvine	0:12	0:11	0:08	0:08
Irvine to San Juan Capistrano	0:14	0:13	0:11	0:11
San Juan Capistrano to San Clemente	0:33*	0:09	0:07	0:05
San Clemente to Oceanside		0:24	0:17	0:16
Oceanside to Solana Beach	0:16	0:15	0:10	0:12
Solana Beach to San Diego	0:33	0:34	0:24	0:18
TOTAL	**2:44**	**2:36**	**1:58**	**1:48**

* San Clemente station is not included in the Baseline Condition.
** For the High-Build Rail Improvements Alternative, the travel time break is at the UTC station.

Operations and Maintenance Costs

Table 4.0-8 summarizes the estimated incremental annual O&M costs for the improved LOSSAN corridor. As previously noted, O&M costs were calculated for the scenarios that represented the three corridor alternatives (No-Project, Low-Build and High-Build Rail Improvements Alternative).

Due to operating efficiencies, as stated previously, there is an inverse relationship between the marginal O&M costs for operating and maintaining the trains and the level of improvements. Conversely, in regards to O&M costs for maintenance-of-ways, there is a direct relationship between the level of improvements for track alignment options and the cost, where the highest Rail Improvements Alternative has the highest cost for maintenance-of-ways.

The incremental O&M cost for the Low-Build Rail Improvements Alternative is 17.9% lower than the No-Project, and 5.0% higher than the High-Build Rail Improvements Alternative. The incremental O&M cost of the High-Build Rail Improvements Alternative is 22.0% lower than the No-Project.

Table 4.0-8
Annual Costs of Operating and Maintaining an Improved Conventional Rail Infrastructure

Item[1,2]	No-Project	Low-Build	High-Build
Annual Cost for Operating and Maintenance of Train (millions 2003$)	$ 45,880,272.82	$ 35,292,517.55	$ 31,763,265.80
Annual Cost for Maintenance of Ways (millions 2003$)	$ 12,240,107.10	$ 12,428,863.20	$ 13,551,720.00
Total Annual O&M Costs (millions 2003$)	$ 58,120,379.92	$ 47,721,380.75	$ 45,314,985.80

4.0.5 Consequences for LOSSAN Corridor without Improvements

As has been presented throughout this chapter, conventional rail improvements to the LOSSAN rail corridor are necessary in order to meet current and future transportation demands.

The data presented in this chapter clearly shows that without these improvements, increasing costs and capacity constraints will continue to hamper existing services, as well as make problematic the expansion of new service to meet increased travel demand. The known and potential cost and operational impacts include:

- Higher maintenance costs due to deferred replacement of timber bridges, as well as bluff stabilization along the corridor.
- Higher operational costs associated with idling trains and reduced efficiency
- Increased deaths, injuries, insurance and equipment costs due to at-grade collisions
- Continuing or worsening air quality due to rail traffic delays at road crossings and lack of track capacity for goods movement coming from the Ports of LA and Long Beach
- Worsening on-time performance for commuter and intercity passenger trains and the inability to expand the number of passenger trains.